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No. III.

MAKING BUTTER.

The Thanks of the Society were presented to George Carter, *Esq., of Mottingham Lodge, near Eltham, Kent, for his Method of obtaining Cream from Milk. A Model of his Milk-pan has been placed in the Society's Repository.*

Mottingham Lodge, near Eltham, Kent,
Sir, *March* 1832.

Herewith you will receive a model of an invention of mine, which I have had in use in my dairy for some months, with great advantage in regard to the quality and quantity of the cream and butter produced. May I request that you will do me the honour to lay the same before the Society, when I shall be much gratified by being allowed to attend and give such further information as the Committee may require?

I am, Sir, &c. &c.

A. Aikin, Esq., George Carter.
Secretary, &c. &c.

A peculiar process of extracting cream from milk, by which a superior richness is produced in the cream, has long been known and practised in Devonshire; this produce of the dairies of that county being well known to every one by the name of " clotted," or " clouted cream." As there is no peculiarity in the milk from which this fluid is extracted, it has been frequently a matter of surprise that the process has not been adopted in other parts of the kingdom.

The opportunities which I possess of making experiments connected with farming induced me to direct my attention to the produce of the dairy with a view to increasing the quantity and quality of cream and butter. Having, therefore, made some inquiry into the practice of the Devonshire dairyman, I found, that besides the improved quality of the cream, a larger quantity of butter was produced by this mode. I therefore adopted their system as the groundwork of my experiments.

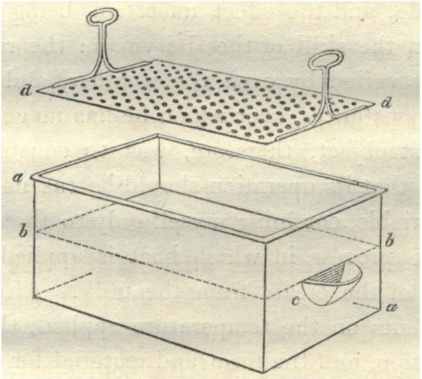
I found, however, that their process is attended with several disadvantages. The mode of applying artificial heat is rude, and the effect uncertain, being entirely dependent on the skill of the dairyman: the result is also perpetually varied by even the weather, and other accidental circumstances, over which he has no control.

My first object, therefore, was to construct my apparatus so that its operation should be (as nearly as possible) invariable, confining myself only to that part of the Devonshire process in which heat is applied to aid the separation of the cream from the milk. After a variety of experiments on the temperature applied, the period of its application, and the form and material for the vessels, I obtained the greatest results by adopting the following process: —

A four-sided vessel *a a* is formed of zinc plates 12 inches long, 8 inches wide, and 6 inches deep, with a false bottom *b b* at one half the depth.

The only communication with the lower compartment is by the lip *c*, through which it may be filled or emptied.

Having first placed at the bottom of the upper compartment a plate of perforated zinc *dd*, the area of which is equal to that of the false bottom, a gallon (or any given quantity) of milk is poured (immediately when drawn from the cow) into it, and must remain there at rest for twelve hours; an equal quantity of boiling water must then be poured into the lower compartment through the lip *c*, it is then permitted to stand twelve hours more (*i. e.* twenty-four hours altogether), when the cream will be found perfect, and of such consistence that the whole may be lifted off by the finger and thumb. It is, however, more effectually removed by gently raising the plate of perforated zinc from the bottom by the ringed handles, by which means the whole of the cream is lifted off in a sheet, without remixing any part of it with the milk below.



With this apparatus I have instituted a series of experiments; and, as a mean of twelve successive ones, I obtained the following results:—

4 gallons of milk, treated as above, produced, in twenty-four hours, 4½ pints of clotted cream, which, after churning only fifteen minutes, gave 40 ounces of butter.

4 gallons of milk, treated in the common mode in earthenware pans, and standing forty-eight hours, produced 4 pints of cream, which, after churning ninety minutes, gave 36 ounces of butter.

The increase in the quantity of cream, therefore, is 12½ per cent, and of butter upwards of 11 per cent.

The advantage, however, is not limited to this increase of quantity, since it appears that in my process ten or fifteen minutes churning is sufficient to produce butter, whilst it requires ninety minutes to produce the same effect with the common cream. The results are also constant; no variety in flavour, colour, or consistency, is observable, although my experiments have been made under circumstances which would have affected all these qualities in the common process.

I am not prepared to declare how much of the advantage of this operation depends on mechanical, and how much on chemical action. It has been long known that the application of artificial heat has facilitated the separation of cream from milk, probably by forming an ascending current in the fluid, as well as disengaging the suspended particles of cream by rendering the whole more liquid. But I have found that the material of which I make my vessels is a very important feature in the process; for the cream is formed in zinc vessels many hours earlier than in earthen ones. I hazard a conjecture, that this is owing to a galvanic effect, which is produced by the lactic and acetic acids (developed in the milk by heat and rest) acting slightly on the zinc plates of the vessel. We have, therefore, two fluids acting on one metal, which is well known to be a galvanic arrangement of the second order. The acids, which would otherwise cause the coagulation of the milk, are thus taken up by the zinc; and the milk, by remaining more perfectly fluid, admits the easy ascent of the suspended cream. I have ascertained, on analysis, the presence of acetate and lactate of zinc in the skim milk, which would, therefore, seem to favour this hypothesis.

I ought to state, that my experiments have been made on land which is not most favourable for the production of butter, it being cold or gravelly; indeed, the whole of the Kentish land is unfit for producing cheese, a certain proof of its inferiority. As, however, my experiments have been comparative, and made with the produce of the same land, so it is reasonable to expect that proportionate advantages will be obtained in all cases, be the land richer or poorer.

I do not claim the merit of originality in this process further than in the use of the zinc vessel, and the mode in which the heat is applied, by which the results are rendered certain and invariable; neither do I profess to have obtained the maximum of quantity which can be produced by this process. The operation, however, is so simple, and its efficiency so apparent, that it cannot be too generally known.

The experimental farmer will instantly perceive the advantages accruing from its adoption, and probably his attention to the subject may produce greater results. I shall feel richly rewarded if, by exciting an interest on the subject, I can produce any the slightest improvement in the quality or mode of producing an article, which may properly be deemed one of the necessaries of life.*

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* It appears from Mr. Carter's statement that milk which has been subjected to his process is more or less impregnated with soluble salts of zinc. The well-known astringency of these salts, and their emetic quality when in a state of moderate concentration, induced the Committee to inquire what use is made of the milk after separation of the cream. Mr. Carter replied, that it is employed wholly in feeding pigs, and that the health and growth of these animals do not appear to be at all affected thereby.